

SAR EVALUATION REPORT

FCC 47 CFR § 2.1093 IEEE Std. 1528-2013

For Wireless Speaker

FCC ID: APIJBLLINKPORT Model Name: LINK PORTABLE

Report Number: 4789043408-SAR-2 Issue Date: July 2, 2019

Prepared for Harman International Industries, Inc. 8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES

Prepared by

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Revision History

Rev.	Date	Revisions	Revised By
V1.0	July 2, 2019	Initial Issue	\

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1. Attestation of Test Results

Applicant Name	Harman International Industries, Inc.				
Address	8500 Balboa Boulevard, Northridge, CA 91329, UNITED STATES				
Manufacturer	Harman International Industries, Inc.				
Address	8500 Balboa Boulevard, Northridge, CA	A 91329, UNITED STATES			
EUT Name	Wireless Speaker				
Model Name	LINK PORTABLE				
Sample Status	Normal				
Brand	JBL				
Sample Received Date	June 14, 2019				
Date of Tested	June 14, 2019 to June 18, 2019				
Applicable Standards FCC 47 CFR § 2.1093 IEEE Std. 1528-2013 IEEE Std. 1528-2013					
SAR Limits (W/Kg)					
Exposure Category	Peak spatial-average(1g of tissue)	Extremities (hands, wrists, ankles, etc.) (10g of tissue)			
General population / Uncontrolled exposure	1.6	4			
The Highest Reported SAR (W/k	kg)				
	Equipm	ent Class			
RF Exposure Conditions	DTS	U-NII			
Body (1-g)	0.954	0.546			
Test Results	Pass				
Tested By:	Reviewed By: Approved By:				
James Um	Sherman dues Gephenbus				
James Qin	Shawn Wen Stephen Guo				
Engineer Project Associate Laboratory Leader Laboratory Manager					

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2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with IEEE Std. 1528-2013, the following FCC Published RF exposure KDB procedures:

- o 248227 D01 802.11 Wi-Fi SAR
- o 447498 D01 General RF Exposure Guidance
- o 690783 D01 SAR Listings on Grants
- o 865664 D01 SAR measurement 100 MHz to 6 GHz
- o 865664 D02 RF Exposure Reporting
- 941225 D07 UMPC Mini Tablet

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3. Facilities and Accreditation

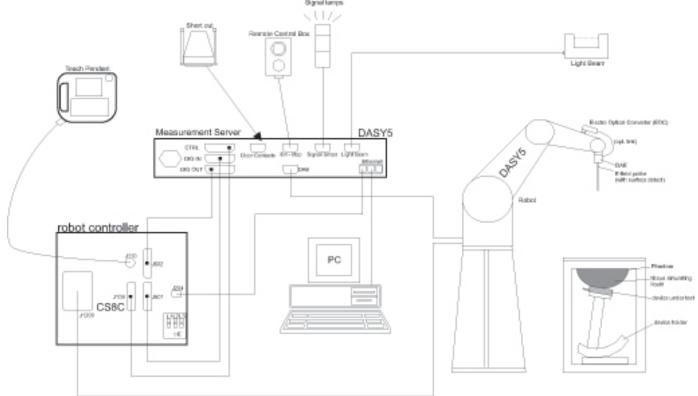
Test Location	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch.		
Address	Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China		
	A2LA (Certificate No.: 4102.01)		
	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been assessed and proved to be in compliance with A2LA.		
	FCC (FCC Recognized No.: CN1187)		
	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules		
Accreditation	IC(Company No.: 21320)		
Certificate	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320.		
	VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)		
	UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793.		
	Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011		
Description	All measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China		

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4. SAR Measurement System & Test Equipment

4.1. SAR Measurement System

The DASY5 system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

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4.2. SAR Scan Procedures

Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

Area Scan Parameters extracted from KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

	\leq 3 GHz	> 3 GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1 \text{ mm}$	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$	
Maximum probe angle from probe axis to phantom surface normal at the measurement location	$30^\circ\pm1^\circ$	$20^\circ\pm1^\circ$	
	\leq 2 GHz: \leq 15 mm 2 – 3 GHz: \leq 12 mm	$\begin{array}{l} 3-4 \ \mathrm{GHz:} \leq 12 \ \mathrm{mm} \\ 4-6 \ \mathrm{GHz:} \leq 10 \ \mathrm{mm} \end{array}$	
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be \leq the corresponding x or y dimension of the test device with at least one measurement point on the test device.		

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Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

			\leq 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}			$\leq 2 \text{ GHz:} \leq 8 \text{ mm}$ 2 - 3 GHz: $\leq 5 \text{ mm}^*$	$3 - 4 \text{ GHz:} \le 5 \text{ mm}^*$ $4 - 6 \text{ GHz:} \le 4 \text{ mm}^*$	
	uniform grid: ∆z _{Zoom} (n)		\leq 5 mm	$3 - 4$ GHz: ≤ 4 mm $4 - 5$ GHz: ≤ 3 mm $5 - 6$ GHz: ≤ 2 mm	
Maximum zoom scan spatial resolution, normal to phantom surface	graded	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	$3 - 4 \text{ GHz:} \le 3 \text{ mm}$ $4 - 5 \text{ GHz:} \le 2.5 \text{ mm}$ $5 - 6 \text{ GHz:} \le 2 \text{ mm}$	
	grid $\Delta z_{Zoom}(n>1)$: between subsequent points		$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$		
Minimum zoom scan volume x, y, z		\geq 30 mm	$3 - 4 \text{ GHz:} \ge 28 \text{ mm}$ $4 - 5 \text{ GHz:} \ge 25 \text{ mm}$ $5 - 6 \text{ GHz:} \ge 22 \text{ mm}$		

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

^{*} When zoom scan is required and the <u>reported</u> SAR from the area scan based *1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan (FCC only)

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be greater than the step size in Z-direction.

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4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

	Name of equipment	Manufacturer	Type/Model	Serial No.	Cal. Due Date
X	ENA Network Analyzer	Keysight	E5080A	MY55100583	December 10, 2019
X	Dielectric Assessment Kit	SPEAG	SM DAK 040 SA	1155	NCR
\boxtimes	DC power supply	Keysight	E36103A	MY55350020	December 10, 2019
\boxtimes	Signal Generator	Rohde & Schwarz	SME06	837633\001	December 10, 2019
\boxtimes	BI-Directional Coupler	WERLATONE	C8060-102	3423	December 10, 2019
\boxtimes	Peak and Average Power Sensor	Keysight	E9323A	MY55440013	December 10, 2019
\boxtimes	Peak and Average Power Sensor	Keysight	E9323A	MY55420006	December 10, 2019
\boxtimes	Dual Channel PK Power Meter	Keysight	N1912A	MY55416024	December 10, 2019
\boxtimes	Amplifier	CORAD TECHNOLOGY LTD	AMF-4D-00400600- 50-30P	1983561	NCR
	Base Station Simulator	Rohde & Schwarz	CMW500	155523	December 10, 2019
X	Dosimetric E-Field Probe	SPEAG	EX3DV4	7383	December 19, 2019
X	Data Acquisition Electronic	SPEAG	DAE3	427	December 11, 2019
	Dipole Kit 750 MHz	SPEAG	D750V3	1153	December 6, 2021
	Dipole Kit 835 MHz	SPEAG	D835V2	4d206	December 5, 2021
	Dipole Kit 900 MHz	SPEAG	D900V2	1d190	December 5, 2021
	Dipole Kit 1800 MHz	SPEAG	D1800V2	2d212	December 6, 2021
	Dipole Kit 1900 MHz	SPEAG	D1900V2	5d212	December 7, 2021
	Dipole Kit 2300 MHz	SPEAG	D2300V2	1065	December 4, 2021
\boxtimes	Dipole Kit 2450 MHz	SPEAG	D2450V2	977	December 4, 2021
	Dipole Kit 2600 MHz	SPEAG	D2600V2	1117	December 7, 2021
\boxtimes	Dipole Kit 5 GHz	SPEAG	D5GHzV2	1231	December 14, 2021
	Software	SPEAG	DASY52	N/A	NCR
\boxtimes	Twin Phantom	SPEAG	SAM V5.0	1805	NCR
\boxtimes	ELI Phantom	SPEAG	ELI V5.0	1235	NCR
\boxtimes	Thermometer	Control Company	4242	150709653	December 6, 2019
\boxtimes	Hygrometer	١	GX-138	١	September 5, 2019

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Note:

- As per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.
 - a) There is no physical damage on the dipole;
 - b) System check with specific dipole is within 10% of calibrated value;
 - c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.
 - d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.
- 2) Dielectric assessment kit is calibrated against air, distilled water and a shorting block performed before measuring liquid parameters.
- 3) NCR is short for "No Calibration Requirement".

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5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std. 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

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6. Device Under Test (DUT) Information

6.1. DUT Description

The DUT is a wireless speaker with IEEE 802.11a/b/g/n/ac, and BT radio.			
Device Dimension Overall (Length x Width x Height): 80 mm x 80 mm x 170 mm			
Battery Options	DC 5V from external AC Adapter DC 3.6V 4800mAh Polymer Li-ion built-in battery		
Accessory Charging stand, Type-C USB Cable			

6.2. Wireless Technology

Wireless technology	Frequency band	Operating mode	
		802.11 b	
Wi-Fi	2.4 GHz	802.11 g	
VVI-1 1	2.4 0112	802.11 n(20M)	
		802.11 n(40M)	
		802.11 a	
		802.11 n(20M)	
Wi-Fi	5 GHz	802.11 n(40M)	
VVI-F1		802.11 ac(20M)	
		802.11 ac(40M)	
		802.11 ac(80M)	
		DH5	
DT	2.4 GHz	2DH5	
BT	2.4 GHZ	3DH5	
		BLE	

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7. SAR Test Configuration

The DUT may be very close to the human body when used, so 1-g Body SAR (5mm) evaluation are considered.

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8. Conducted Output Power Measurement and tune-up tolerance

8.1. 2.4GHz Wi-Fi of ANT 1

Mode	Channel	Frequency (MHz)	Data Rate	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test	Duty Cycle (%)
	1	2412		17.93	18.5		98.70
802.11b	6	2437	1Mbps	17.63	18.5	Required	
	11	2462		18.42	18.5		
	1	2412	6Mbps	17.70	18.0	Excluded	87.80
802.11g	6	2437		17.51	18.0		
	11	2462		17.95	18.0		
802.11n-	1	2412	MCS0	17.56	18.0	Excluded	93.80
802.11h- HT20	6	2437		17.36	18.0		
11120	11	2462		17.98	18.0		
000.11-	3	2422	MCS0	15.52	16.0	Excluded	87.10
802.11n- HT40	6	2437		17.40	18.0		
П140	9	2452		17.45	18.0		

8.2. 2.4GHz Wi-Fi of ANT 2

Mode	Channel	Frequency (MHz)	Data Rate	Average Power (dBm)	Tune-up Limit (dBm)	SAR Test	Duty Cycle (%)	
	1	2412		17.87	18.5			
802.11b	6	2437	1Mbps	17.59	18.5	Required	98.70	
	11	2462		18.25	18.5			
	1	2412		17.67	18.0			
802.11g	6	2437	6Mbps	17.54	18.0	Excluded	87.80	
	11	2462		18.30	18.5			
000.11m	1	2412		17.48	18.0			
802.11n- HT20	6	2437	MCS0	17.39	18.0	Excluded	93.80	
11120	11	2462		18.28	18.5			
000.11	3	2422		15.58	16.0			
802.11n- HT40	6	2437	MCS0	17.15	18.0	Excluded	87.10	
11140	9	2452		17.34	18.0			

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8.3. 5GHz Wi-Fi of ANT 1

Band	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-up Limit (dBm)	SAR Test	Duty Cycle (%)
		36	5180		13.80	14.0		
	000 44 -	40	5200	Ch dha a	13.82	14.0	F eederal and	00 50
	802.11a	44	5220	6Mbps	13.60	14.0	Excluded	92.50
		48	5240		13.61	14.0		
		36	5180		13.85	14.0		
	802.11n-HT20	40	5200	MCS0	13.97	14.0	Excluded	92.05
	002.1111-1120	44	5220	WC30	13.75	14.0	Excluded	92.05
		48	5240		13.78	14.0		
U-NII-1	802.11n-HT40	38	5190	MCS0	16.86	17.0	Excluded	86.17
	002.1111 - 11140	46	5230	MC30	16.36	17.0	Excluded	80.17
		36	5180		13.72	14.0		
	802.11ac-	40	5200	MCS0	13.98	14.0	Excluded	92.60
	VHT20	44	5220	10030	13.56	14.0	Excluded	92.00
		48	5240		13.51	14.0		
	802.11ac-	38	5190	MCS0	16.64	17.0	Excluded	92.60
	VHT40	46	5230	WC30	16.23	17.0	Excluded	92.00
	802.11ac- VHT80	42	5210	MCS0	16.01	16.5	Excluded	85.00
		52	5260		17.54	18.0		
	802.11a	56	5280	GMbpa	17.55	18.0	Excluded	92.50
	602.11a	60	5300	6Mbps	18.63	19.0		92.50
		64	5320		18.56	19.0		
	802.11n-HT20	52	5260		17.70	18.0	Excluded	
		56	5280	MCS0	17.77	18.0		00.05
		60	5300		18.63	19.0		92.05
		64	5320		18.96	19.0		
U-NII-2A	802.11n-HT40	54	5270	MCS0	19.61	20.0	Excluded	86.17
	оо <u>2.1111-</u> п140	62	5310	WC30	20.70	21.0	Excluded	00.17
		52	5260		17.70	18.0		
	802.11ac-	56	5280	MCS0	18.57	19.0	Evoludod	92.60
	VHT20	60	5300	WC30	18.51	19.0	Excluded	92.00
		64	5320		18.68	19.0		
	802.11ac-	54	5270	MCS0	19.55	20.0	Evoludod	92.60
	VHT40	62	5310	WC30	20.49	21.0	Excluded	92.00
	802.11ac- VHT80	58	5290	MCS0	20.93	21.0	Required	85.00
		100	5500		18.96	19.0		
		104	5520		18.22	19.0		
		108	5540]	18.90	19.0]	
		112	5560		18.93	19.0		
U-NII-2C	802.11a	116	5580	6Mbps	18.71	19.0	Excluded	92.50
		120	5600		18.72	19.0		
		124	5620		18.74	19.0		
		128	5640		18.71	19.0		
		132	5660		18.78	19.0		

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		136	5680		18.71	19.0	1 1	
		140	5700	-	16.44	16.5	-	
		144	5720		16.20	16.5	-	
		100	5500		19.14	19.5		
		104	5520	-	19.10	19.5	1	
		108	5540		19.12	19.5	-	
		112	5560		19.14	19.5	-	
		116	5580		19.34	19.5	-	
		120	5600		19.34	19.5		
	802.11n-HT20	124	5620	MCS0	19.32	19.5	Excluded	92.05
		128	5640		19.34	19.5	-	
		132	5660		19.23	19.5	-	
		136	5680		19.36	19.5	-	
		140	5700		16.25	16.5	-	
		144	5720	-	16.23	16.5	-	
		102	5510		21.41	21.5		
		110	5550	-	21.47	21.5	1	
		118	5590	-	21.50	21.5		
	802.11n-HT40	126	5630	MCS0	20.23	20.5	Excluded	86.17
		134	5670	-	19.12	19.5	-	
		142	5710	-	19.49	19.5	-	
		100	5500		18.96	19.0		
		100	5520	-	18.63	19.0	-	
	-	104	5540	-	18.23	19.0	-	
		112	5560	-	18.32	19.0	-	
		112	5580	MCS0	18.85	19.0	-	
	802.11ac-	120	5600		17.23	19.0	Excluded	
	VHT20	120	5620		18.96	19.0		92.60
	11120	124	5640		18.45	19.0		
		132	5660	-	18.91	19.0		
		132	5680	-	18.94	19.0	-	
		130	5700	-	16.49	19.0	-	
				-		16.5	-	
		144	5720		16.36			
		102 110	5510 5550	-	20.83 21.10	21.5 21.5	-	
	000 1100	110	5590	-	21.10	21.5	-	
	802.11ac- VHT40	118	5630	MCS0	21.08	21.5	Required	92.60
	VIIITU	126	5670	-	19.48	21.5 19.5	-	
		134	5710	-	19.40	19.5	-	
		142	5530		20.48	20.5	++	
	802.11ac-	106	5610	MCS0	20.48	20.5	Excluded	85.00
	VHT80			NIC30				05.00
		138 149	5690 5745		20.22	20.5	┼───┼	
		149	5765	-	17.14 17.07	18.0	-	
	902 112			GMbaa		18.0		02 50
	802.11a	157	5785	6Mbps	17.86	18.0	Excluded	92.50
-NII-3		161	5805	4	17.57	18.0	-	
		165	5825		16.19	16.5	++	
		149	5745	MOOO	17.07	17.5		00.05
	802.11n-HT20	153	5765	MCS0	17.11	17.5	Excluded	92.05
		157	5785		17.14	17.5		
			P	age 18 of 41				

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UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch

U

	161	5805		17.23	17.5		
	165	5825		15.29	15.5		
802.11n-HT40	151	5755	MCS0	19.57	20.0	Excluded	86.17
оuz.1111-п140	159	5795	MC30	19.97	20.0	Excluded	00.17
	149	5745		17.57	18.0		
000 44	153	5765		17.43	18.0		
802.11ac- VHT20	157	5785	MCS0	18.15	18.5	Excluded	92.60
VIIIZO	161	5805		16.23	16.5		
	165	5825		16.38	16.5		
802.11ac-	151	5755	MCS0	19.52	20.0	Excluded	92.60
VHT40	159	5795	10030	19.70	20.0	Excluded	92.00
802.11ac- VHT80	155	5775	MCS0	20.50	20.5	Required	85.00

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UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch

8.4. 5GHz Wi-Fi of ANT 2

Band	Mode	Channel	Frequency (MHz)	Data Rate	Average power (dBm)	Tune-up Limit (dBm)	SAR Test	Duty Cycle (%)
		36	5180		13.94	14.5		
	000 110	40	5200	CMbpa	14.14	14.5	Evoluded	00.50
	802.11a	44	5220	6Mbps	14.23	14.5	Excluded	92.50
		48	5240		13.62	14.5		
		36	5180		14.29	14.5		
	802.11n-HT20	40	5200	MCS0	14.40	14.5	Evoludod	02.05
	оо <u>2.110-</u> п120	44	5220	MCS0	14.13	14.5	Excluded	92.05
		48	5240		14.17	14.5		
U-NII-1	802.11n-HT40	38	5190	MCS0	17.15	17.5	Excluded	86.17
	оо <u>2.1111-</u> П140	46	5230	WC30	16.61	17.0	Excluded	00.17
		36	5180		14.31	14.5		
	802.11ac-	40	5200	MCS0	14.40	14.5	Excluded	92.60
	VHT20	44	5220	10030	14.23	14.5	Excluded	92.00
		48	5240		14.13	14.5		
	802.11ac-	38	5190	MCS0	16.89	17.0	Evoludod	02.60
	VHT40	46	5230	MCS0	16.45	17.0	Excluded	92.60
	802.11ac- VHT80	42	5210	MCS0	16.56	17.0	Excluded	85.00
		52	5260		17.76	18.0		
	802.11a	56	5280	6Mbps	17.23	18.0	Excluded	92.50
		60	5300	olviops	18.72	19.0	Excluded	92.50
		64	5320		18.90	19.0		
	802.11n-HT20	52	5260	MCS0	18.05	18.5	- Excluded	
		56	5280		18.16	18.5		92.05
		60	5300		18.98	19.0		92.05
		64	5320		18.96	19.0		
U-NII-2A	802.11n-HT40	54	5270	MCS0	20.02	20.5	Excluded	86.17
0 111 2/1	002.1111-11140	62	5310	WC30	21.22	21.5	Excluded	00.17
		52	5260		17.99	19.0		
	802.11ac-	56	5280	MCS0	18.89	19.0	Excluded	92.60
	VHT20	60	5300	MC30	18.91	19.0	Excluded	92.00
		64	5320		18.97	19.0		
	802.11ac-	54	5270	MCS0	20.06	21.0	Excluded	92.60
	VHT40	62	5310	WC30	20.98	21.0	Excluded	92.00
	802.11ac- VHT80	58	5290	MCS0	21.46	21.5	Required	85.00
		100	5500		19.24	20.0		
		104	5520		19.35	20.0		
		108	5540		19.26	20.0		
		112	5560		19.13	20.0		
U-NII-2C	802.11a	116	5580	6Mbps	19.37	20.0	Excluded	92.50
		120	5600		19.13	20.0		
		124	5620		19.43	20.0		
		128	5640		19.76	20.0		
		132	5660		19.43	20.0		

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UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch

FORM NO: 10-SL-F0036

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802.11a 157 5785 6Mbps 18.38 18.5 Excluded 92.50 I01 5805 16.63 17.0 165 5825 16.87 17.0 16.87 17.0 16.87 17.0 16.87 17.0 16.87 18.18 18.5 92.50 92.50 802.11n-HT20 153 5765 MCS0 18.13 18.5 Excluded 92.05			149	5745			18.0]	
161 5805 16.63 17.0 165 5825 16.87 17.0 149 5745 18.18 18.5 802.11n-HT20 153 5765 MCS0 18.13 18.5 Excluded 92.05			153	5765		17.36	18.0		
165 5825 16.87 17.0 149 5745 18.18 18.5 802.11n-HT20 153 5765 MCS0 18.13 18.5 Excluded 92.05		802.11a	157	5785	6Mbps	18.38	18.5	Excluded	92.50
165 5825 16.87 17.0 149 5745 18.18 18.5 802.11n-HT20 153 5765 MCS0 18.13 18.5 Excluded 92.05	NII 2		161	5805		16.63	17.0		
802.11n-HT20 153 5765 MCS0 18.13 18.5 Excluded 92.05	-111-3		165	5825		16.87	17.0		
			149	5745		18.18	18.5		
		802.11n-HT20	153	5765	MCS0	18.13	18.5	Excluded	92.05
] [

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U

	161	5805		17.23	17.5		
	165	5825		17.12	17.5		
802.11n-HT40	151	5755	MCS0	20.20	20.5	Excluded	86.17
оuz.1111-п140	159	5795	MC30	20.47	20.5	Excluded	00.17
	149	5745		18.30	18.5		
802.11ac-	153	5765	MCS0	18.13	18.5	Excluded	
802.11ac- VHT20	157	5785		18.39	18.5		92.60
VIIIZO	161	5805		17.42	17.5		
	165	5825		17.10	17.5		
802.11ac-	151	5755	MCS0	20.32	20.5	Excluded	92.60
VHT40	159	5795	10030	20.28	20.5	Excluded	92.00
802.11ac- VHT80	155	5775	MCS0	20.61	21.0	Required	85.00

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8.5. BT

BT	Average (Conducted P	Tune-up Limit	Duty Cycle	
Ы	0CH	39CH	78CH	(dBm)	(%)
GFSK	8.19	8.82	9.21	9.5	50.0
∏/4-DQPSK	8.26	8.91	9.18	9.5	65.2
8DPSK	8.31	8.88	9.18	9.5	57.6

BT	Average (Conducted P	ower (dBm)	Tune-up Limit	Duty Cycle	
Ы	0CH	19CH	(dBm)	(%)		
BLE	4.31	4.91	5.17	5.5	57.52	

Note:

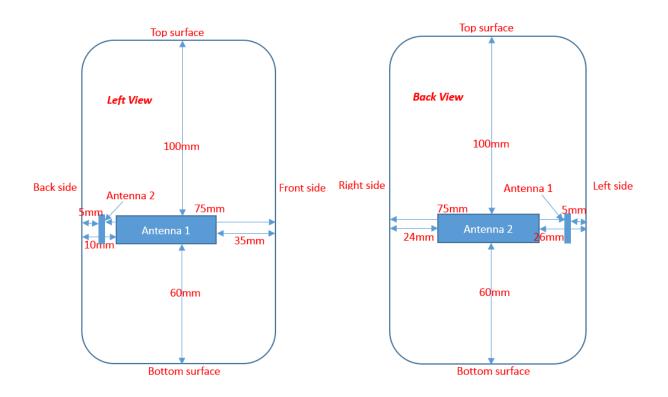
1) As per KDB 447498 sec.4.1.d) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

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9. RF Exposure Conditions

Refer to the diagram inside the device which attached below for the specific details of the antennas to outer surface distances.



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Per FCC KDB 447498D01:

1. The 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances \leq 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)]·[$\sqrt{f}(GHz)$] \leq 3.0 for 1-g SAR and \leq 7.5 for product specific 10-g SAR, where:

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

2. The SAR exclusion threshold for distances >50mm is defined by the following equation, as illustrated in KDB 447498 D01 Appendix B:

a) at 100 MHz to 1500 MHz

[Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm) (f(MHz)/150)] mW b) at > 1500 MHz and ≤ 6 GHz

[Power allowed at numeric Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW

For BT 1-g SAR

Frequency	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculated Result	Threshold	SAR Test
2480	9.50	8.91	5.00	2.8	3.0	Excluded

Note:

1) Because the calculated result is less than the threshold, so SAR evaluation for BT 1-g SAR is not required.

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For 2.4G Wi-Fi 1-a SAR	(antenna to outer	surface senaration	distance les	se than 50mm)
FUI 2.46 WI-FI I-9 SAK	(antenna to outer	Surface Separation	uistance les	s (1a) (0) (1a)

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculation Result	Threshold	SAR Test
Top surface	2462	18.50	70.79	100.00	١	١	\
Bottom surface	2462	18.50	70.79	60.00	١	١	\
Left side for ANT 1	2462	18.50	70.79	5.00	22.2	3.0	Required
Left side for ANT 2	2462	18.50	70.79	26.00	4.3	3.0	Required
Right side for ANT 1	2462	18.50	70.79	75.00	١	١	\
Right side for ANT 2	2462	18.50	70.79	24.00	4.6	3.0	Required
Front side for ANT 1	2462	18.50	70.79	35.00	3.2	3.0	Required
Front side for ANT 2	2462	18.50	70.79	75.00	١	١	\
Back side ANT 1	2462	18.50	70.79	10.00	11.1	3.0	Required
Back side ANT 2	2462	18.50	70.79	5.00	22.2	3.0	Required

Note:

1) If the calculated result is greater than the threshold, SAR evaluation for the corresponding position is required. If not, SAR evaluation for the corresponding position is not required.

For 2.4G Wi-Fi 1-g SAR (antenna to outer surface separation distance greater than 50mm)

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Power allowed at 50mm (mW)	Separation Distance (mm)	Calculation Result (mW)	SAR Test
Top surface	2462	18.50	70.79	95.60	100.00	595.60	Excluded
Bottom surface	2462	18.50	70.79	95.60	60.00	195.60	Excluded
Left side for ANT 1	2462	18.50	70.79	95.60	5.00	١	١.
Left side for ANT 2	2462	18.50	70.79	95.60	26.00	١	١
Right side for ANT 1	2462	18.50	70.79	95.60	75.00	345.60	Excluded
Right side for ANT 2	2462	18.50	70.79	95.60	24.00	١	١
Front side for ANT 1	2462	18.50	70.79	95.60	35.00	١	١
Front side for ANT 2	2462	18.50	70.79	95.60	75.00	345.60	Excluded
Back side ANT 1	2462	18.50	70.79	95.60	10.00	\	١
Back side ANT 2	2462	18.50	70.79	95.60	5.00	١	١

Note:

1) If the power in mW is greater than the calculated result, SAR evaluation for the corresponding position is required. If not, SAR evaluation for the corresponding position is not required.

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For 5G Wi-Fi 1-g SAR (antenna to outer surface separation distance less than 50mm)

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Separation Distance (mm)	Calculation Result	Threshold	SAR Test
Top surface	5825	21.50	141.25	100.00	١	١	١
Bottom surface	5825	21.50	141.25	60.00	١	١	١
Left side for ANT 1	5825	21.50	141.25	5.00	68.2	3.0	Required
Left side for ANT 2	5825	21.50	141.25	26.00	13.1	3.0	Required
Right side for ANT 1	5825	21.50	141.25	75.00	١	١	١
Right side for ANT 2	5825	21.50	141.25	24.00	14.2	3.0	Required
Front side for ANT 1	5825	21.50	141.25	35.00	9.7	3.0	Required
Front side for ANT 2	5825	21.50	141.25	75.00	١	١	١
Back side ANT 1	5825	21.50	141.25	10.00	34.1	3.0	Required
Back side ANT 2	5825	21.50	141.25	5.00	68.2	3.0	Required

Note:

1) If the calculated result is greater than the threshold, SAR evaluation for the corresponding position is required. If not, SAR evaluation for the corresponding position is not required.

Position	Frequency (MHz)	Power (dBm)	Power (mW)	Power allowed at 50mm (mW)	Separation Distance (mm)	Calculation Result (mW)	SAR Test
Top surface	5825	21.50	141.25	62.15	100.00	562.15	Excluded
Bottom surface	5825	21.50	141.25	62.15	60.00	162.15	Excluded
Left side for ANT 1	5825	21.50	141.25	62.15	5.00	١	١
Left side for ANT 2	5825	21.50	141.25	62.15	26.00	١	١
Right side for ANT 1	5825	21.50	141.25	62.15	75.00	312.15	Excluded
Right side for ANT 2	5825	21.50	141.25	62.15	24.00	١	١
Front side for ANT 1	5825	21.50	141.25	62.15	35.00	١	١
Front side for ANT 2	5825	21.50	141.25	62.15	75.00	312.15	Excluded
Back side ANT 1	5825	21.50	141.25	62.15	10.00	١	N
Back side ANT 2	5825	21.50	141.25	62.15	5.00	١	١

For 5G Wi-Fi 1-g SAR (antenna to outer surface separation distance greater than 50mm)

Note:

1) If the power in mW is greater than the calculated result, SAR evaluation for the corresponding position is required. If not, SAR evaluation for the corresponding position is not required.

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10. Dielectric Property Measurements & System Check

10.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18° C to 25° C and within $\pm 2^{\circ}$ C of the temperature when the tissue parameters are characterized.

The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 - 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.

Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

Tissue Dielectric Parameters

FCC KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

Target Frequency (MHz)	H	ead	Bo	ody
rarget requency (Minz)	ε _r	σ (S/m)	۶ _r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5000	36.2	4.45	49.3	5.07
5100	36.1	4.55	49.1	5.18
5200	36.0	4.66	49.0	5.30
5300	35.9	4.76	48.9	5.42
5400	35.8	4.86	48.7	5.53
5500	35.6	4.96	48.6	5.65
5600	35.5	5.07	48.5	5.77
5700	35.4	5.17	48.3	5.88
5800	35.3	5.27	48.2	6.00

IEEE Std 1528-2013 Refer to Table 3 within the IEEE Std 1528-2013

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Dielectric Property Measurements Results:

		Lic	quid Pa	aramete	rs	Deviation(%)		Lingit	Tomp		
Liquid	Freq.	Measured		Target		Deviation(70)		Limit (%)	Temp. (℃)	Test Date	
		€r	σ	€ _r	σ	€ _r	σ	(70)			
	2360	38.31	1.75	39.36	1.72	-2.66	1.57			June 14, 2019	
Head 2450	2450	37.97	1.84	39.20	1.80	-3.13	2.44	±5	22.4		
	2540	37.66	1.94	39.09	1.90	-3.66	66 2.16				
	5160	34.65	4.51	36.03	4.61	-3.83	-2.08			June 17, 2019	
Head 5250	5250	34.46	4.58	35.93	4.71	-4.09	-2.80	±5	21.8		
	5340	34.35	4.66	35.83	4.80	-4.13	-2.94				
	5500	34.41	4.90	35.64	4.96	-3.45	-1.21				
Head 5600	5600	34.33	5.00	35.53	5.07	-3.38	-1.48	±5	22.1	June 18, 2019	
	5700	34.20	5.09	35.41	5.17	-3.42	-1.47				
	5660	35.90	5.07	35.46	5.13	1.24	-1.25				
Head 5750	5750	35.82	5.14	35.36	5.22	1.30	-1.63	±5	21.3	June 18, 2019	
	5840	35.67	5.24	35.27	5.30	1.13	-1.08				

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10.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

System Performance Check Measurement Conditions:

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm (above 1GHZ) and 15mm (below 1GHz) from dipole center to the simulating liquid surface.
- For area scan, standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤2GHz), 12 mm in x- and y-dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz).
- For zoom scan, Δx_{zoom} , $\Delta y_{zoom} \le 2$ GHz ≤ 8 mm, 2-4GHz ≤ 5 mm and 4-6 GHz- ≤ 4 mm; $\Delta z_{zoom} \le 3$ GHz ≤ 5 mm, 3-4 GHz- ≤ 4 mm and 4-6GHz- ≤ 2 mm.
- Distance between probe sensors and phantom surface was set to 3 mm except for 5 GHz band. For 5GHz band, Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was set to 100 mW or 250 mW depend on the certificate of the dipoles.
- The results are normalized to 1 W input power.

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System Check Results

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

		Measure	ed Results	Target	Delta	Limit	Temp.	T (D (
T.S. Liquid		Zoom Scan (W/Kg)	Normalize to 1W (W/Kg)	(Ref. value)	(%)	(%)	(°C)	Test Date	
Head 2450	1-g	12.900	51.60	53.70	-3.91	±10	22.4	June 14, 2019	
Heau 2450	10-g	5.870	23.48	25.00	-6.08	±10	22.4	June 14, 2019	
Head 5250	1-g	8.250	82.50	78.60	4.96	±10	21.8	June 17, 2019	
Head 5250	10-g	2.410	24.10	22.50	7.11	±10	21.0	June 17, 2019	
Head ECOO	1-g	8.800	88.00	81.20	8.37	±10	22.1	luno 19, 2010	
Head 5600	10-g	2.540	25.40	23.40	8.55	±10	22.1	June 18, 2019	
Head 5750	1-g	8.130	81.30	80.00	1.63	±10	21.3	June 18, 2019	
Head 5750	10-g	2.300	23.00	22.80	0.88	±10			

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11. Measured and Reported (Scaled) SAR Results

As per KDB 447498 sec.4.1.e), When SAR or MPE is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported.

SAR Test Reduction criteria are as follows:

KDB 447498 D01 General RF Exposure Guidance:

A) Per KDB447498 D01 v06, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.

B) Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz.
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.

Per KDB865664 D01 v01r04:

For each frequency band, repeated SAR measurement is required only when the measured SAR is \geq 0.8W/Kg; if the deviation among the repeated measurement is \leq 20%, and the measured SAR <1.45W/Kg, only one repeated measurement is required.

Per KDB 248227 D01 v02r02:

For Wi-Fi SAR testing, a communication link is set up with the testing software for Wi-Fi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 v02r02 are applied. (Refer to KDB 248227D01 v02r02 for more details)

Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for <u>initial test position</u> can be applied. Using the transmission mode determined by the DSSS procedure or <u>initial test configuration</u>, area scans are measured for all position in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the <u>initial test position</u> is ≤ 0.4 W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test position are measured. For all positions/configurations tested using the <u>initial test position</u> and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions /configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Initial Test Configuration Procedure

An <u>initial test configuration</u> is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01 v02r02). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the <u>initial test position</u> procedure is applied to minimize the number of test positions required for SAR

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measurement using the <u>initial test configuration</u> transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the <u>initial test configuration</u>. When the reported SAR of the <u>initial test configuration</u> is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Sub Test Configuration Procedure

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the <u>initial test configuration</u> are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units. When the highest reported SAR for the <u>initial test configuration</u>, according to the <u>initial test position</u> or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to <u>initial test configuration</u> specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

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11.1. SAR Test Results of 2.4G Wi-Fi

Test Position (Body 5mm)	Test Mode	de Channel/ Channel/ (dBm)		Measured SAR Value	Power Drift	Duty Cycle	Scaled (W/Kg)		
(Body Shiii)		rrequency	Tune-up Meas.		1-g (W/Kg)	Dim	(%)	(ww/rxg)	
ANT 1									
Left side	802.11b	11/2462	18.50	18.42	0.832	0.12	98.70	0.859	
Front side	802.11b	11/2462	18.50	18.42	0.102	-0.10	98.70	0.105	
Back side	802.11b	11/2462	18.50	18.42	0.074	0.07	98.70	0.076	
Left side	802.11b	1/2412	18.50	17.93	0.826	-0.13	98.70	0.954	
	Repea	ted test at wor	st measure	d SAR co	onfiguration ab	ove			
Left side	802.11b	11/2462	18.50	18.42	0.800	-0.13	98.70	0.826	
ANT 2									
Back side	802.11b	11/2462	18.50	18.25	0.573	-0.08	98.70	0.615	
Left side	802.11b	11/2462	18.50	18.25	0.161	-0.20	98.70	0.173	
Right side	802.11b	11/2462	18.50	18.25	0.139	0.14	98.70	0.149	

OFDM mode SAR evaluation exclusion analysis for 1-g SAR for ANT.1

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11b	18.5	70.79	0.954	\	١
802.11g	18.0	63.10	١	0.850	Excluded
802.11n (20M)	18.0	63.10	Ň	0.850	Excluded
802.11n (40M)	18.0	63.10	١	0.850	Excluded

Note:

1) The highest reported SAR for DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is \leq 1.2 W/kg, so SAR evaluation for 802.11g/n is not required.

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OFDM mode SAR evaluation exclusion analysis for 1-g SAR for ANT.2

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11b	18.5	70.79	0.615	١	١
802.11g	18.5	70.79	١	0.615	Excluded
802.11n (20M)	18.5	70.79	\	0.615	Excluded
802.11n (40M)	18.0	63.10	\	0.548	Excluded

Note:

1) The highest reported SAR for DSSS adjusted by the ratio of OFDM 802.11g/n to DSSS specified maximum output power and the adjusted SAR is \leq 1.2 W/kg, so SAR evaluation for 802.11g/n is not required.

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11.2. SAR Test Results of 5G Wi-Fi

Test Position	Test Mode	Channel/	Power (dBm)		Measured SAR Value	Power Drift	Duty Cycle	Scaled
(Body 0mm)		Frequency	Tune-up	Meas.	1-g (W/Kg)	Drift	(%)	(W/Kg)
			ANT 1					
			U-NII-2A					
Left Side	802.11ac-VHT80	58/5290	21.00	20.93	0.293	0.02	85.00	0.350
Back Side	802.11ac-VHT80	58/5290	21.00	20.93	0.045	0.15	85.00	0.054
Front Side	802.11ac-VHT80	58/5290	21.00	20.93	0.048	-0.12	85.00	0.058
			U-NII-2C					
Left Side	802.11ac-VHT40	126/5630	21.50	21.12	0.370	-0.10	92.60	0.436
Back Side	802.11ac-VHT40	126/5630	21.50	21.12	0.104	-0.20	92.60	0.123
Front Side	802.11ac-VHT40	126/5630	21.50	21.12	0.047	-0.16	92.60	0.055
			U-NII-3					
Left Side	802.11ac-VHT80	155/5775	20.50	20.50	0.464	0.16	85.00	0.546
Back Side	802.11ac-VHT80	155/5775	20.50	20.50	0.057	-0.07	85.00	0.067
Front Side	802.11ac-VHT80	155/5775	20.50	20.50	0.042	-0.20	85.00	0.050
			ANT 2					
			U-NII-2A					
Back Side	802.11ac-VHT80	58/5290	21.50	21.46	0.348	0.02	85.00	0.413
Left Side	802.11ac-VHT80	58/5290	21.50	21.46	0.034	-0.10	85.00	0.040
Right Side	802.11ac-VHT80	58/5290	21.50	21.46	0.018	-0.11	85.00	0.021
			U-NII-2C		•			
Back Side	802.11ac-VHT80	122/5610	21.50	21.14	0.400	-0.03	85.00	0.511
Left Side	802.11ac-VHT80	122/5610	21.50	21.14	0.055	-0.15	85.00	0.071
Right Side	802.11ac-VHT80	122/5610	21.50	21.14	0.019	-0.04	85.00	0.024
			U-NII-3		•			
Back Side	802.11ac-VHT80	155/5775	21.00	20.61	0.349	-0.17	85.00	0.449
Left Side	802.11ac-VHT80	155/5775	21.00	20.61	0.077	0.18	85.00	0.098
Right Side	802.11ac-VHT80	155/5775	21.00	20.61	0.023	-0.17	85.00	0.030

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Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for ANT 1 (U-NII-2A)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11ac 80M	21.0	125.89	0.350	\	١
802.11a	19.0	79.43	١	0.221	Excluded
802.11n 20M	19.0	79.43	١	0.221	Excluded
802.11n 40M	21.0	125.89	١	0.350	Excluded
802.11ac 20M	19.0	79.43	١	0.221	Excluded
802.11ac 40M	21.0	125.89	١	0.350	Excluded

Note:

 The 802.11ac 80M mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

Subsequent test	configuration	n SAR evalu	ation exclusi	on analysis f	or 1-g SAR f	or ANT 1 (U-NII-2C)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11ac 40M	21.5	141.25	0.436	١	١
802.11a	19.0	79.43	١	0.245	Excluded
802.11n 20M	19.5	89.13	١	0.275	Excluded
802.11n 40M	21.5	141.25	١	0.436	Excluded
802.11ac 20M	19.0	79.43	١	0.245	Excluded
802.11ac 80M	20.5	112.20	١	0.346	Excluded

Note:

 The 802.11ac 40M mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

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Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for ANT 1 (U-NII-3)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11ac 80M	20.5	112.20	0.546	\	\
802.11a	18.0	63.10	١	0.307	Excluded
802.11n 20M	17.5	56.23	\	0.274	Excluded
802.11n 40M	20.0	100.00	١	0.487	Excluded
802.11ac 20M	18.5	70.79	\	0.345	Excluded
802.11ac 40M	20.0	100.00	١	0.487	Excluded

Note:

 The 802.11ac 80M mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for ANT 2 (U-NII-2A)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11ac 80M	21.5	141.25	0.413	١	١
802.11a	19.0	79.43	١	0.232	Excluded
802.11n 20M	19.0	79.43	١	0.232	Excluded
802.11n 40M	21.5	141.25	١	0.413	Excluded
802.11ac 20M	19.0	79.43	١	0.232	Excluded
802.11ac 40M	21.0	125.89	١	0.368	Excluded

Note:

 The 802.11ac 80M mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

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Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for ANT 2 (U-NII-2C)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11ac 80M	21.5	141.25	0.511	١	١
802.11a	20.0	100.00	١	0.362	Excluded
802.11n 20M	20.5	112.20	١	0.406	Excluded
802.11n 40M	21.5	141.25	١	0.511	Excluded
802.11ac 20M	20.0	100.00	١	0.362	Excluded
802.11ac 40M	21.5	141.25	١	0.511	Excluded

Note:

 The 802.11ac 80M mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

Subsequent test configuration SAR evaluation exclusion analysis for 1-g SAR for ANT 2 (U-NII-3)

Mode	Tune-up (dBm)	Tune-up (mW)	Highest Reported SAR (W/Kg)	Adjusted SAR (W/Kg)	SAR Test
802.11ac 80M	21.0	125.89	0.449	١	\
802.11a	18.5	70.79	١	0.252	Excluded
802.11n 20M	19.0	79.43	١	0.283	Excluded
802.11n 40M	20.5	112.20	١	0.400	Excluded
802.11ac 20M	18.5	70.79	١	0.252	Excluded
802.11ac 40M	20.5	112.20	١	0.400	Excluded

Note:

 The 802.11ac 80M mode is selected as Initial Test Configuration for SAR test according to the specified maximum output power. As the highest reported SAR for the initial test configuration is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR test for the other 802.11 modes are not required.

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12. Simultaneous Transmission SAR Analysis

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna.

The ANT 1 supports 2.4GHz and 5GHz Wi-Fi, the ANT 2 supports 2.4GHz, 5GHz Wi-Fi and BT, they can't work at the same time, so simultaneous transmission doesn't exist.

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Appendixes

Refer to separated files for the following appendixes.

- 4789043408-SAR-2_App A Photo
- 4789043408-SAR-2_App B System Check Plots
- 4789043408-SAR-2_App C Highest Test Plots
- 4789043408-SAR-2_App D Cal. Certificates

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